

IP Triple Play

voice | video | data

IP NEXT-GENERATION
NETWORKS



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"...the entry of big telcos into the IP Triple Play market using IPTV will make it a must-have feature for any major provider of broadband services. However, offers will need to be well thought-out and innovative to attract customers, and must take full advantage of the greater flexibility inherent in a TV proposition based around broadband and IP"

January 2007, Graham Finnie, Senior Analyst, Heavy Reading

The different IPTV strategies pursued by operators are clearly influenced by a number of factors. If they see IPTV's best role as churn prevention and broadband customer acquisition, then aggressive pricing on similar services that are already in the market might be the best bet. That is, to compete on things that customers already understand — such as speed and price — while at least matching the TV experience offered by the cable operators. If extra revenue per customer is the priority, then greater emphasis on interactive services and pay-TV (exclusive content, perhaps) might be the best IPTV approach, although more risky and more costly. The marketing push here would be on the greater functionality that IPTV provides compared with cable TV.

Telecommunications Magazine, September 2006



Executive Summary

Delivering Global Solutions

Allied Telesis has fused the worlds of IP/Ethernet and Carrier-class access technologies to create a truly comprehensive range of solutions for IP Triple Play Service Providers. All the hallmarks of the Allied Telesis portfolio of solutions are to be found in these industry-leading, global internetworking solutions which span across a wide range of solutions and market segments including Carriers, Network Service Providers, System Integrators and Post, Telegraph and Telephone administrations (PTTs) worldwide. These solutions include: Carrier-class integrated iMAP Multiservice Access Platforms, iMG intelligent Multiservice Gateways[†], iBG intelligent Business Gateways and the Provisioning and Management systems: Zero Touch Configurator (ZTC) and Network Management Software (NMS).

The Challenge Facing Today's Revenues

Today's network service providers are faced with on going pressure to maximize profitability. Revenues from traditional services (i.e. voice and data) are on the decline as competition is encroaching on established Operators and Service Providers. Furthermore, a plain 'vanilla' Broadband offering is no longer a business opportunity and is quickly becoming a commoditized offering with little or no margin to the Providers. One logical approach for addressing the margin erosion and revenue pressures is to generate additional sources of revenue through new innovative service offerings. These new services need to be added whilst getting the most from existing infrastructure as well as leveraging telecom de-regulation frameworks. One area that many Providers and System Integrators (SI) are now focusing attention on is interactive entertainment services. Broadcast video, Pay-Per-View (PPV) and Video-on-Demand (VoD) are just a few of the high-value services that Operators and System Integrators can provide. Combined with high-speed Internet access and traditional voice services, a potent 'Triple Play' of voice, video and data can be bundled together in attractive service packages to significantly improve Providers' revenues and profits.

The whole is greater than the sum of individual parts

The bundled package of services is intended to return more benefits to end-customers by offering a more affordable service tariff than the aggregation of charges for individual services.

'Bundling' Services

The advantages of 'bundling' services have been proven by traditional cable TV Operators who also offer packaged voice, video and data services. These Operators have demonstrated that average revenues per subscriber can be increased and customer churn can be reduced by service bundling. The traditional local exchange Carrier or competitive operator can also realize these benefits by offering their own service bundles. Recent technology advancements now enable these traditional wireline Service Providers to offer a 'Triple Play' package of voice, video and data services using either fiber optic or voice-grade copper facilities. Moreover, emerging Operators from different industries and sectors such as utilities, hospitalities, municipalities and housing associations can leverage their established infrastructure and customer relationship to offer advanced innovative services at a more competitive price-performance point than previously achieved.

Bundling services creates the 'Halo Effect'[‡] with subscribers and end-customers. This effect increases their loyalty, creates more 'stickiness' and encourages uptake of other service offerings available from the provider.

[†] iMG formerly referred to as the 'Residential Gateway' or 'RG'.

[‡] The 'Halo Effect' describes the effect that a positive experience with one aspect of a service infers about other aspects of a service. The perception is that the overall service is better than the sum of the individual parts.



The Changing Landscape

Technology and economics advancements in DSL technology have been the primary enabler of IP Triple Play service packaging among PTTs and alternative Carriers, due to the ability to offer high bandwidth over existing copper facilities. In many countries, these facilities have been 'opened-up' - unbundled - for competitive use allowing alternative Carriers to access these subscriber lines as well. With DSL services like ADSL2+ (Asymmetrical Digital Subscriber Line) providing high bandwidth access at speeds of up to 26Mbps and VDSL2 providing up to 100Mbps today, it is now possible to provide a high quality, high definition, video service to multiple TV sets while simultaneously providing high-speed Internet access and several telephone lines over a single copper loop. By utilizing this 'fixed investment', these Operators can dramatically improve profitability, increasing revenues per loop by up to four times their current revenue.

Video compression technology, a key component of IP Triple Play, has also improved dramatically over recent years. The MPEG-2 (Motion Picture Engineer Group 2) standard has been deployed globally for video compression applications. Video compression technology is developing and advancing quickly with the introduction of techniques like MPEG-4 and Windows Media 9 that are far more efficient and require much less bandwidth. Soon, Carriers and Service Providers will be able to stream high quality video at less than 1Mbps. These technologies will be crucial in the deployment of high bandwidth services such as High Definition Television (HDTV). Also, the availability of proven and well-established interactive video platforms combined with the emergence of video content aggregators and brokers is beginning to facilitate access to IP-based video content.

The Customer Premise Equipment (CPE) plays a fundamental role in the delivery of IP Triple Play services. As traditional broadband CPE devices such as modems and home routers cannot support these new services, Operators will need access

to 'intelligent' Multiservice Gateway devices in order to enable IP Triple Play delivery to customer premises. To be competitive, the total cost per end-customer connection must be kept to a minimum. The price performance ratio for the CPE device is the key to validating the business model of Service Providers and Operators. The economies of scale provided by the adoption of Ethernet technology have helped to pave the way to the 'right' price point for the new advanced IP Triple Play ready CPE devices, proving the business case for the provider.

The Allied Telesis Value Proposition

Allied Telesis builds state-of-the-art IP, transport, aggregation, access and customer premise equipment for next-generation broadband networks capable of supporting the most rigorous of IP Triple Play services' requirements. In addition, Allied Telesis provides true end-to-end systems with high availability networking products incorporating latest developments in Ethernet management and protection for 99.999% reliability. The solution architecture provides radically improved efficiency and manageability of network infrastructures whilst solving the QoS bottleneck for handling time sensitive IP multi-media traffic. Many vendors are keen to promote the 'evolutionary not revolutionary' angle for their products but Allied Telesis is proud to describe its Carrier-class Ethernet-based systems as truly revolutionary. So, regardless of the service provider's access network – copper or fiber access – Allied Telesis has an end-to-end, fully managed solution for providing IP Triple Play services.

With a comprehensive offering of IP next-generation broadband technologies, services and expertise and dozens of real IP Triple Play deployments with live paying customers, Allied Telesis is uniquely positioned to assist Carriers and Providers with delivering innovative and high-value services to residential and business customers.

Access Technologies Overview

The largest component of any Carrier service deployment is the 'access' portion of the network, which connects access nodes to individual subscribers. Literally, it is the last link, also known as 'last mile' or 'first mile', in a network between the customer premises and the first point of connection to the network infrastructure - a Point of Presence (PoP), Exchange or Central Office (CO).

The access network has consistently been regarded as a bottleneck in the provisioning of new communications services. This is primarily due to the fact that technology tends to be put in place for a specific purpose and in doing so it has traditionally been difficult for this same infrastructure to carry new services. Furthermore, the bandwidth available has lagged behind that provided within Local Area Networks (LANs) and in the upper echelons of the network (in Metro and Core networks, for example), where concentration factors and economies of scale have allowed optical fiber to unleash significant bandwidth capacity. It's worth noting that these dedicated transport facilities to the actual end-subscriber and associated CPE (Customer Premises Equipment) make up most of the cost of those service deployments. In fact, at least 50% of all network CAPEX costs are in the access network and often have a long depreciation period.

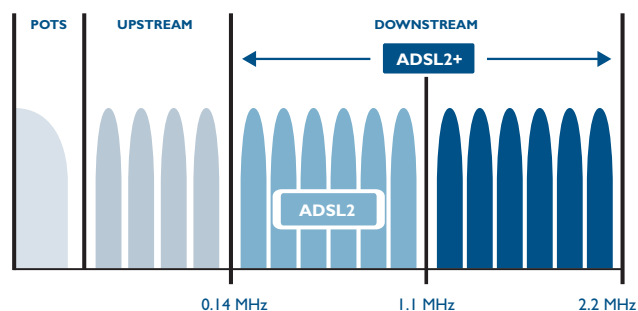
Fortunately, Service Providers can now utilize access solutions that are based on the ubiquitous, economical technology of Ethernet in their deployment of IP Triple Play services. Allied Telesis is a world-class leader in IP Ethernet-based solutions and can assist Carriers and Operators in deploying these IP Triple Play solutions with our state-of-the-art Carrier-class Ethernet products.

Broadband ADSL/ADSL2+ over Copper

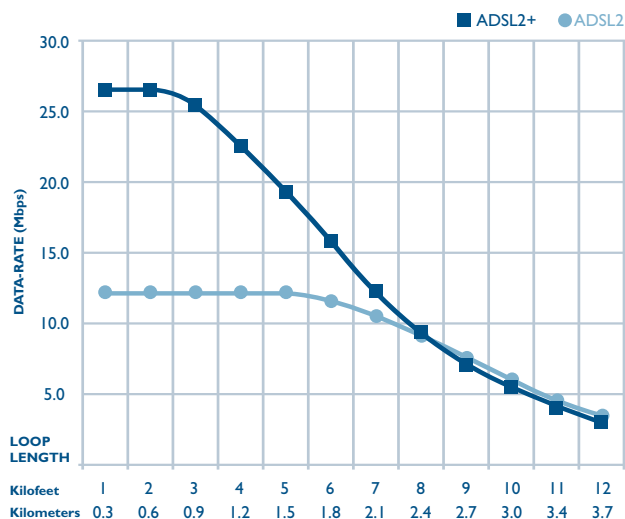
ADSL is the most widely deployed xDSL technology to date with over 250 million lines in service already. Additions and enhancements to the ADSL specification have improved the data-rate and reach to enable the delivery of IP Triple Play services over voice-grade copper lines. The ADSL2+ enhancement has been designed to offer higher data-rates (26Mbps) over longer distances.

The improvements provide better modulation efficiency, lower framing overhead, and enhanced signal processing algorithms. In fact, ADSL2+ doubles the maximum frequency of the downstream transmission to 2.2 MHz. This translates into the doubling of the maximum downstream data-rate to 26Mbps at distances up to 600 meters, with the possibility of achieving rates of up to 20Mbps on loops less than 1,500 meters in length.

This extended loop reach allows high-speed access to the vast majority of residential and business subscribers in Europe where loop lengths tend to be the shortest compared to the rest of the world.



ADSL2+ doubles the bandwidth used to carry downstream data.
Source: DSL Forum



ADSL2+ doubles the maximum downstream data-rate.
Source: DSL Forum

Fiber-To-The-Home, Business, Building or Node using Ethernet

Fiber is an unparalleled medium to deliver any imaginable media-rich and interactive portfolio of services. Fiber is a true 'future proof' technology providing virtually unlimited bandwidth and allowing Operators to scale their networks efficiently depending on service demand and technological developments.

Deploying fiber deeper in the access network and nearer to subscribers opens up a plethora of revenue opportunities for Operators and Service Providers. The reach is measured in 10's of kilometers and bandwidth is virtually unlimited. Whether it is Fiber-To-The-Home or to the Business, support of certain value-added services is only possible on fiber. These services include high quality video services such as HDTV, video telephony and surveillance, Peer-to-Peer services and applications as well as business connectivity services such as leased lines and VPNs.

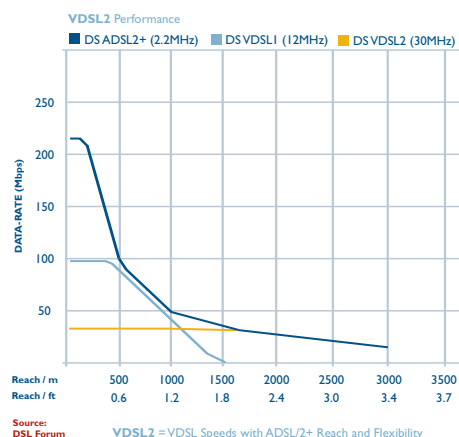
In 'greenfield' sites, capital expenditure (capex) of a fiber roll-out is comparable if not less expensive to that of copper. There are significant savings from the newly-built fiber in reduced operational expenses (OPEX) as fiber is considered a very low maintenance technology. Fiber is often described as one access network, for multiple services, for the next 100 years!

When fiber is deployed deeper in the access network and closer to subscribers, **VDSL2** can be deployed to bring higher bandwidth over shorter copper loops. VDSL2, the newest and most advanced standard of xDSL, permits the transmission of asymmetric and symmetric data rates up to 100Mbps over voice-grade copper pairs. VDSL2 promises to deliver 100Mbps at 0.5 km and 50Mbps at 1 km from the Central Office or remote node. Furthermore, its main advantage is backward compatibility with ADSL2+ technology allowing already deployed CPEs to continue to operate normally and only require upgrading when more advanced services are uptaken.

Ethernet and IP

On the technology side, Ethernet has become the de facto standard in data communication with well over 98% of traffic on the Internet today, starting and terminating on an Ethernet port. Ethernet provides a simple 'flat' Layer 2 network that can recognize the economies of scale of Ethernet components to provide the most simple, high-bandwidth, cost-effective access network possible. The message is clear: Ethernet is ubiquitous in the LAN sphere and is now breaking open the 'last mile' bottleneck between end-users and high-speed networks. With rates of up to 100Mbps and 1Gbps full-duplex per subscriber, there's enough bandwidth available to ensure that, once a network is installed, it has the horsepower to cope with all future demands.

Ethernet and IP-based technologies have proven to be much more scalable and cost-effective than traditional TDM or ATM technologies. In fact, the fastest growing format for ADSL and FTTx deployments today is Ethernet/IP-based solutions rather than the legacy ATM-based multiplexers so prevalent in the 1990s.



The Allied Telesis Carrier-grade intelligent Ethernet-based DSL and FTTx solutions enable Service Providers to move away from complex and expensive circuit technologies such as ATM and Frame Relay whilst realizing improved profitability via advanced service offerings such as high quality voice, tiered IP/Ethernet data services and broadcast quality IP video.

IP Triple Play Building Blocks

IP Triple Play Services

Carriers today know that transport services alone – however ‘fat’ the pipe - will not sufficiently drive revenue and growth to meet both investor’s expectations and growing customer demands. New services are required to offset declining revenues, face up to increasing competition and to enable growth whilst speeding up the rate of profitability. Operators need a simple and flexible network architecture that will enable the delivery of voice, video and data services that can realize significant multipliers of current revenues per subscriber, known as Average Revenue Per Subscriber or ARPU.

The Allied Telesis IP Triple Play architecture provides the underlying infrastructure to allow Service Providers and Operators to quickly offer a full line of enhanced services that can increase revenues from day one. These services include:

- Residential and Business High-speed Internet Access
- Low-cost Voice services including Flat Rate packages
- Broadcast and speciality TV channels
- Pay-Per-View (PPV)
- Community TV
- Video-on-Demand (VoD) and subscription VoD
- Personal Video Recorder (PVR)
- Directed advertising
- Smart Home services (wireless networking, tele-metering, security system)
- Caller ID on Television
- Electronic Programming Guide (EPG)

The iMAP 9000 family of IP-based Multiservice Access Platforms consolidate IP DSLAM, BLC and IP Ethernet FTTx switching functionalities to unlock the potential of the local loop infrastructure by driving unprecedented amounts of bandwidth to the subscriber. This enables a number of new revenue-generating services to be delivered simultaneously over the voice-grade copper runs or the fiber cable all the way to the home. Embedded in the solutions architecture is the capability to provide higher classes of service for specific subscribers’ data

flows. Also, the Allied Telesis architecture provides a flexible Layer 2 transport pipe from the subscribers’ PC or local network to the preferred Internet PoP.

Furthermore, multiple video streams can now be supported over the local loop, allowing the possibility for multiple TV sets within the house to receive different TV or video channels simultaneously. This takes place in addition to the capability of benefiting from advanced Internet packages and low-cost telephony service.

‘Triple Play’ refers to the integration of Internet access (data), telephone (voice) and TV (video) on a single network and bundled under a single brand.

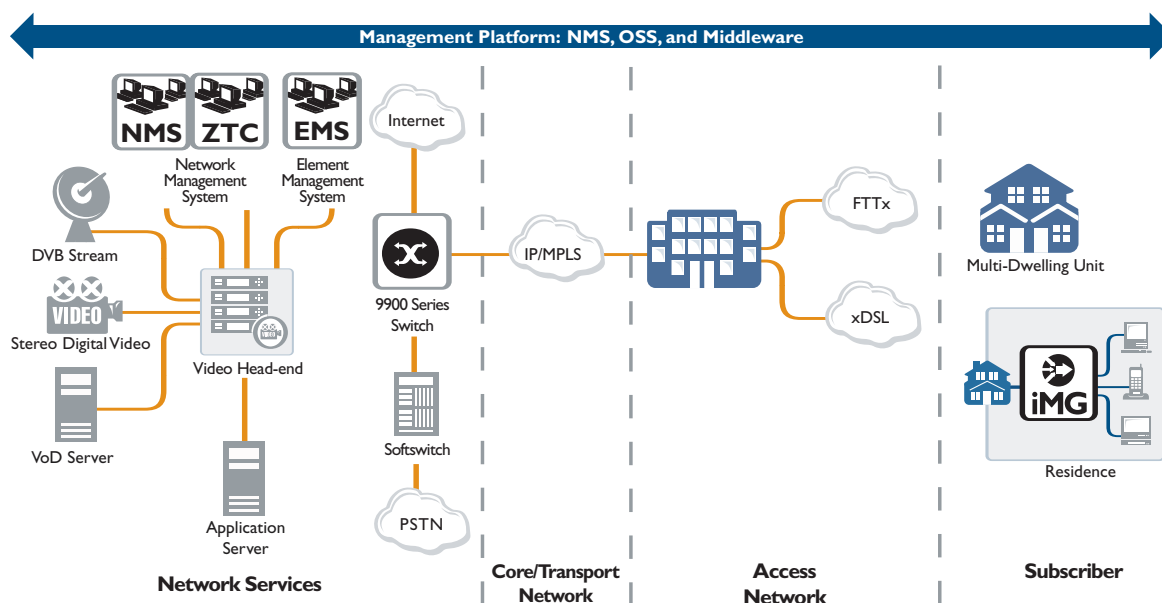
The Allied Telesis iMG 600 and iBG 900 series of Triple Play-enabled Customer Premise Equipment act as the ‘intelligent’ device at subscriber premises presenting these advanced services to end-customers.

The following are examples of the business services that Carriers and Operators could offer:

- Transparent LAN services
- Ethernet Leased lines
- Converged Network VPN service
- Support for existing TDM services E1/T1
- Flexible and granular bandwidth steps
- Centrex VoIP
- IP Fax
- Tele-conferencing

These services can only be implemented cost-effectively using Ethernet/IP-based architectures which provide scalability, robustness and economies of scale in equal measure. Relying on standards-based protocols and techniques like IGMP (Internet Group Management Protocol) and CoS/QoS (Class of Service/Quality of Service) ensures that Operators can safely offer voice, video and data ‘bundles’ as well as other value-added services that generate additional revenue streams and profits to Carriers and Service Providers.

IP Triple Play Building Blocks



The building blocks of the IP Triple Play infrastructure consist of several elements that inter-work to provide voice, video and data applications and services. These are presented in the diagram above.

Network Services

Video Head-end

Video content is sourced, aggregated and managed at the video head-end, located at the most convenient point on the network. The video head-end includes antennae, dishes, receivers, encoders, digital turn-around systems and video servers, all of which are used to create and manage IP-based video streams to be sent across the network. Both analog and digital feeds can be processed by the head-end. Analog feeds are encoded and compressed using real-time encoders whilst digital satellite and terrestrial feeds are transformed into IP streams using digital turn-around systems. Video servers are used to store content assets for Video-on-Demand, (VoD) or near Video-on-Demand (nVoD) services as well as advanced services like network-based Personal Video Recording (PVR) and local advertisement insertion.

High quality, full motion video such as live sports channels can now be successfully compressed to less than 3Mbps streams. MPEG-2 encoding technique enables hundreds of video 'channels' to be transported simultaneously over a network interface and transport mechanism such as Gigabit Ethernet. Several encoder vendors now offer IP-based video encoders which typically use MPEG-2 for encoding with 10/100 or even Gigabit Ethernet as the output. These encoders offer adjustable rates for video channels with an encoding rate of 3.5-4.0Mbps being the predominant range. In addition, they can take input from the analog source of video content from off-air, satellite or video servers and encode the content into MPEG-2 or MPEG-4 format and transmit at a Constant Bit Rate (CBR) using pre-assigned multicast IP addresses. These rates offer high picture quality that is comparable or better than that of S-VHS. For digital feeds, the functionality of a digital turn-around system includes de-multiplexing of the Multi-Program Transport Stream (MPTS), rate shaping (optional) and encapsulation of the individual streams into IP packets. The de-multiplexer takes the MPTS and separates it into single programs that are then



encapsulated into IP packets and transmitted on the network using multicast IP addresses. When rate shaping is enabled, each Variable Bit Rate (VBR) program is turned into CBR signals before encapsulation into IP packets.

To this end, Allied Telesis has partnered with encoder vendors such as Tandberg Television, Minerva Networks and Thomson to ensure reliable, end-to-end network integrity. See pg 18 for more information on Technology partners.

IP Telephony System

Another key technology, now available, is the third leg of the IP Triple Play – voice. Voice services can now be successfully offered via Ethernet/IP systems due to advances in Quality of Service (QoS) techniques. No longer do Carriers have to deploy ATM just to secure QoS capabilities. Offering QoS over Ethernet enables multiple services (i.e. Triple Play) to be provided over a common Ethernet-based access solution. Voice, like video, has significant delay and jitter restrictions that must be accommodated. Without effective QoS metrics, large volumes of data traffic can adversely and critically impact upon the service quality of voice traffic. Voice over IP (VoIP) allows Carriers and Operators to finally bypass the local loop, cutting costs and accelerating service provisioning. Furthermore, IP Telephony provides users with access to a wider range of advanced features, enabled by the latest soft-switching technology. Media Gateways are then used to convert the VoIP traffic arriving at head-end into TDM-compatible 'data' for input into a CLASS 5 voice switch, typically via V5.2 or GR-303 for termination on the PSTN network.

Allied Telesis enables end-to-end IP Telephony solutions with the iMAP 9000 series of integrated Multiservice Access Platforms, the iMG 600 series of intelligent Multiservice Gateways and the iBG 900 series of intelligent Business Gateways. The iMAP 9000 provides Broadband Loop Carrier (BLC) functionality for centralized delivery of POTS service over copper loops. The iMG 600 and iBG 900 provides de-centralized CPE-based delivery of IP telephony service over POTS or ISDN BRI interfaces.

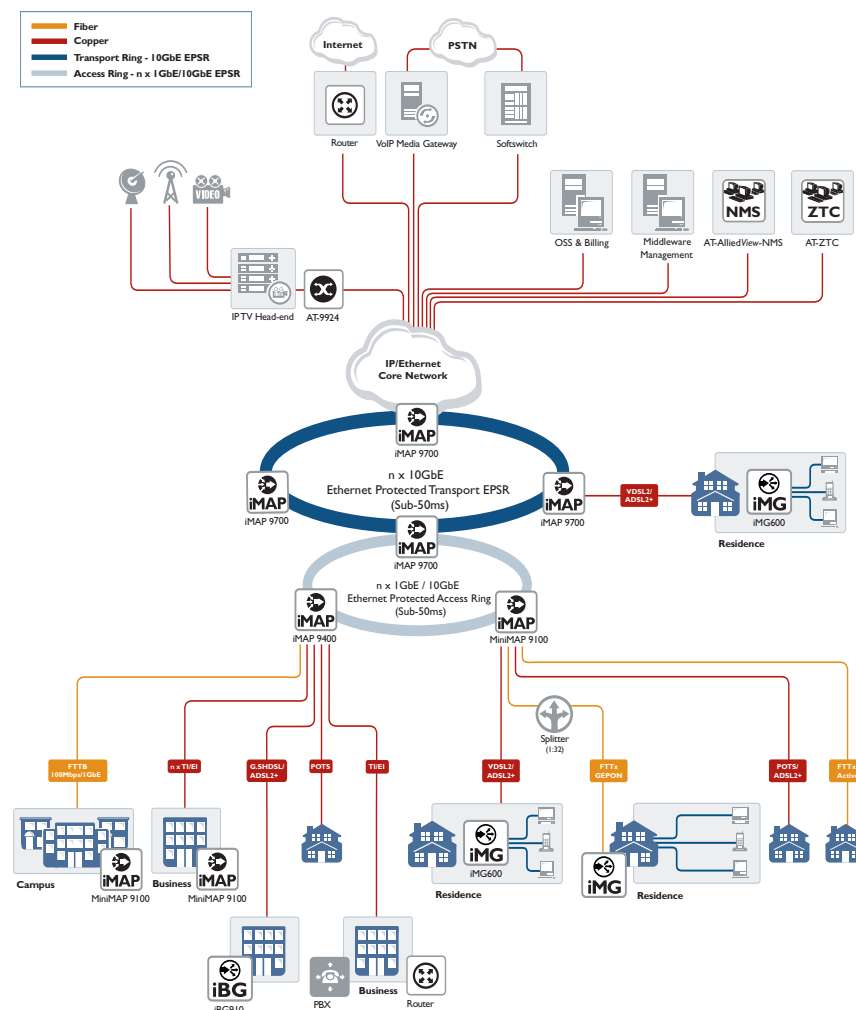
The iMG 600 series has proven field interoperability with leading soft-switch vendors supporting SIP, MGCP and H.323. These vendors include Cirpack, Sonus Networks, Net Centrex (now Comverse), Siemens and Ericsson to name a few. Allied Telesis has partnered with a number of gateway vendors such as Mediatrix, General Bandwidth and MetaSwitch to deliver fully interoperable solutions. See pg 18 for more information on Technology partners.

The Core/Transport Network

Transport of multimedia services across the core network can be performed using various technologies. Historically, every service required building a separate network and Operators ended up having too many overlays run by too many support systems. Deploying service-specific networks became cumbersome and expensive to operate reliably. The creation of a single converged core network capable of delivering multiple services is highly attractive for reasons of flexibility, economies of scale and operating efficiencies. IP/MPLS is now the de facto protocol ubiquitous in the networking world to encapsulate traffic and to provide an interface between the network and the applications. The IP protocol is increasingly and directly associated with Ethernet as the transport and access mechanism of the future.



IP Next-generation Networks



IP/MPLS was designed to deliver benefits of a connection-oriented infrastructure, such as the optimization and traffic engineering as well as the simplicity of packet-based technologies. These benefits, coupled with features such as enhanced resilience using MPLS fast re-route and DiffServ coding to enhance the QoS of the IP network, make IP/MPLS a natural choice for the converged core network and a popular delivery mechanism for new services at the network edge (i.e. access layer).

Today, the technology deployed in the core is usually based on an IP/MPLS architecture for large deployments and on a fully

resilient pure Carrier-class IP and Ethernet for small-to-medium size deployments.

How it Works

Content and services are fed to the core/transport network as illustrated in the diagram above. The aggregation 'node' is configured in a survivable resilient topology using the industry-standard **Ethernet Protection Switch Ring** (RFC 3519) restoration protocol providing sub-50ms fail-over time. The aggregation network takes voice, video and data services that are in IP format and transports them to access hubs and nodes for distribution to subscribers and end-customers.



IP Layer 3 Switches

Certain services such as broadcast video will require Layer 3 switches to enable the aggregation of multicast (broadcast) video channels at the central site and the distribution across the network to access nodes. These switches also direct data, control, and Voice over IP traffic to the head-end. This switching environment must support IGMP (Internet Group Management Protocol) for IP Multicasting and QoS/CoS (Quality of Service/Class of Service) data prioritization schemes, in order to successfully deliver these services.

Allied Telesis offers the 86xx, 89xx and x900 series of multi-layer Gigabit switches with top class capabilities to enable Service Providers to easily deliver IP Triple Play services. These switches are used to aggregate video streams, control the IGMP sessions and overall routing of multicasts (PIM routing), allowing consistent and reliable delivery of multicast and unicast traffic to subscribers' Set Top Boxes (STBs) and TV sets.



This means that Service Providers and Operators enjoy significant control over delivering different levels of service quality, concurrently. The internal switch fabric of these switches forward tens of millions of packets per second ensuring high performance delivery without any network delays or bottlenecks. Because these switches are fully IGMP

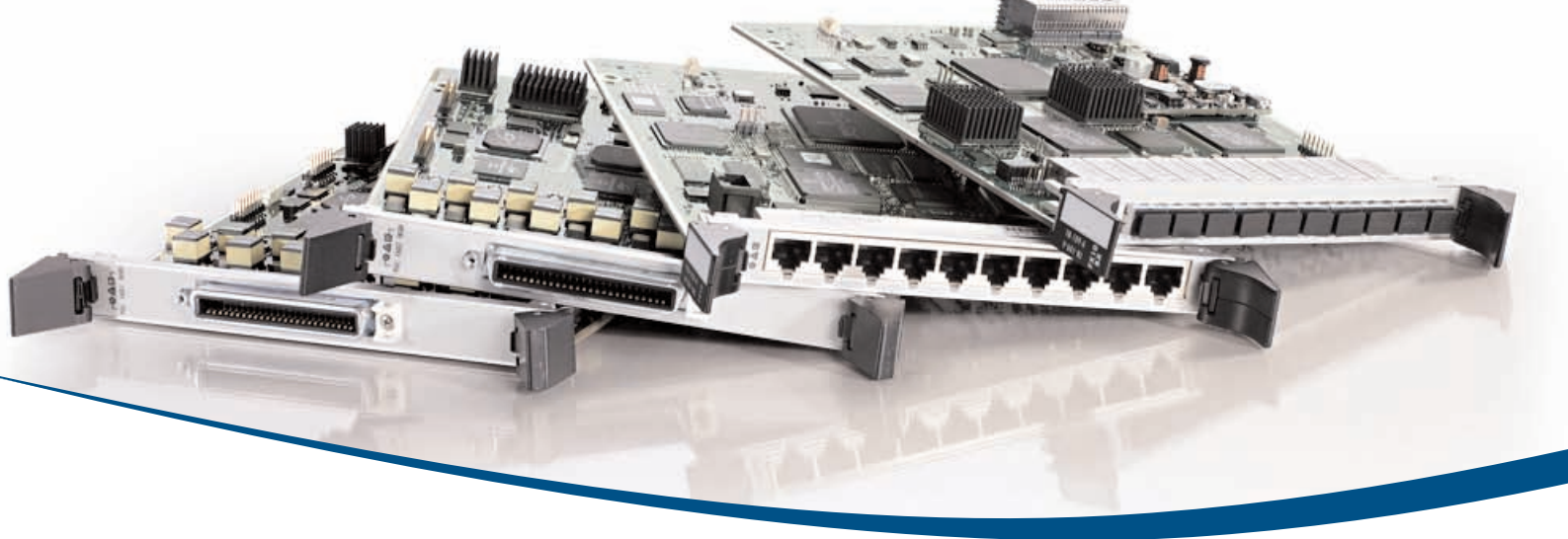
aware routers with a highly tuned implementation, they substantially help maintain multicast group memberships to enable optimized multicast video delivery, the end result of which is a 'user experience' that satisfies their often-high, multi-channel viewing expectations.

The Access Network

DSL and FTTx Technologies

For voice-grade copper access networks, an Ethernet-based IP DSLAM (DSL Access Multiplexer) is deployed to provide ADSL/ADSL2+ or VDSL2 services. The DSLAM acts as the exchange switch for DSL connections, much as a traditional voice exchange switch supports circuit-switched voice traffic, except in packetized data format in this case. The DSLAM provides multiple, high-capacity resilient Gigabit Ethernet uplinks to support high-bandwidth video services. For combined fiber and DSL access networks, powerful 'Carrier class' high-performance multiservice access platforms are deployed, supporting multiple 10/100, Gigabit Ethernet and DSL subscriber interfaces. This solution is ideal for providing both revenue-generating residential services and high-margin high-demand business offerings over DSL and fiber deployments.

The Allied Telesis solution is based on integrated platforms that support multiple services over any type of access technologies. The Allied Telesis iMAP 9000 series are the result of extensive field experience in delivering Carrier-grade solutions and in knowing what is required in order to deliver superior IPTV services. The iMAP platform is a Carrier-grade, fully redundant (99.999%) product and is targeted at deployments in Central Offices (CO), telephone exchanges, outside plants (OSP), remote nodes and in-building environments. Using ADSL2+ or VDSL2, the platforms supports up to 26Mbps/60Mbps connections over copper loops and up to 1 Gbps over fiber ones. The iMAP platform is optimized to deliver video with unique hierarchal support for IP Multicasting, ensuring video service enablement on fully populated chassis with the highest



service availability. Furthermore, the iMAP family can be configured in fully Carrier-grade resilient ring topology in the access network using the industry-standard Ethernet Protection Switch Ring (EPSR) restoration protocol providing sub-50ms fail-over time. This quick recovery time is key to maintaining high-levels of service and meeting customer expectations in video service.

Key product family attributes are:

- Rapid IGMP join and leave service times make for optimized video delivery and fast response to subscriber channel changes
- Assignable monitoring levels and limits to ensure video services are not over-subscribed
- IGMP snooping to ensure optimal use of xDSL and system bandwidth by delivering video services only to subscriber ports that are currently requesting a particular channel
- Carrier-grade sub-50ms failover time to maintain customer video experience and expectation
- Conditional access where only paying subscribers can receive video services and thereby protect valuable content from theft of service
- Extensive debugging features provide detailed information, such as IGMP subscription tables to the operations team, enabling rapid problem resolution

Unlike any other current Ethernet/IP-based DSLAM solutions available on the market, Allied Telesis breaks the myth that only ATM-based DSLAMs can reliably deliver different service levels. Inherent within the design of the iMAP 9000 series integrated Multiservice Access Platforms are Class of Service (CoS) queues. These queues, when joined with strict scheduling mechanisms, will enable creation of different service level policies which are necessary to successfully deliver delay-sensitive voice services and jitter-sensitive broadcast video services, especially when under heavy traffic loads.

The iMAP 9000 series integrated Multiservice Access Platforms are ideal for Metro Ethernet Operators connecting business customers who require the ability to readily provide and manage segmented sub-networks, or VLANs, connecting groups of users working within a single department or remote workgroups. This is achieved through a robust implementation of the IEEE 802.1Q VLAN double-tagging (QinQ) technique allowing a revolutionary support for Transparent LAN Services (TLS). Furthermore, the iMAP 9000 series allows Service Providers to support varying Classes of Service (CoS) for their business customers and the option for them to charge their users at different rates according to the level of service provided. For detailed information regarding these products please refer to the Allied Telesis 'Guide to iMAP'.



IP Triple Play CPE

For the subscriber CPE, an economical, fully featured, intelligent multimedia, multiservice gateway is required to support IP transport for the IP Triple Play services.

Allied Telesis is a leader in the development of next-generation gateways, offering the iMG 600 series intelligent Multiservice Gateways. All operator's value-add services to subscribers can be terminated on these Allied Telesis intelligent Multiservice Gateways, featuring support for multiple WAN access technologies and a complete suite of integrated features. Multiple 10/100 Ethernet ports are available to connect all of subscribers' home Ethernet-based appliances, such as PCs, laptops, printers as well as Set-Top Boxes. Each Ethernet port offers wirespeed throughput in addition to IGMP snooping to support multiple, simultaneous video streams without impacting on any other voice or data services.

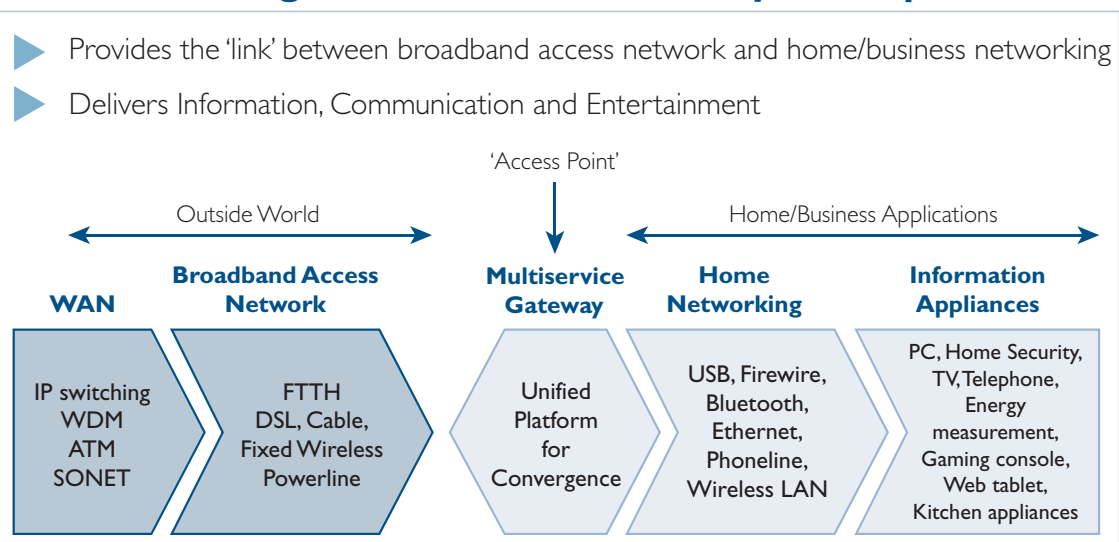
The iMG 600 gateways offer full support for bandwidth rate-limiting on the 10/100 ports with extensive granularity capability

enabling Operators to offer differentiated service packages meeting the different subscribers' requirements and lifestyles whilst creating additional revenue opportunities for the Operators. Furthermore, this feature enhances the security of the Operators' network by protecting it from malicious packet flooding.

With extensive support for Voice over IP protocols and services, the gateways provide traditional interfaces for telephony supporting both analog (POTS) and ISDN phones. SIP, H.323 and MGCP full support gives Providers and Operators the flexibility to choose the voice services that are optimal for their network setup whilst leveraging technical knowledge and expertise within the organization.

For business end-users, Allied Telesis offers the iBG 900 series intelligent Business Gateway. The iBG 900 series are ideal for the delivery of SME applications and services including IP Triple Play.

intelligent Multiservice Gateway Concept



Whether the access network is based on copper or fiber (or even both), IP Triple Play service delivery is easily achievable with the Allied Telesis iMG 600 series. These gateway platforms support multiple WAN access technologies including ADSL/ADSL2+ as well as Ethernet in its various physical media options. Allied Telesis has introduced a field-proven innovative form factor for the fiber model for easy rollouts of CPEs. This approach reduces footprint on customer premises and allows for phased deployments of passive (PON) and active components fitting perfectly with FTTx projects plans and timelines.

The iMG series residential and iBG series business multiservice gateways provide additional functions such as Battery backup, Stateful Inspection Firewall protection, NAT (Network Address Translation), VLAN tagging as well as QoS/CoS to fully support IP Triple Play delivery.

For environments where video content is only available in native Cable TV formats, a member of the iMG 600 family provides the capability to combine Hybrid Fiber Coax (HFC) based video content with IP/Ethernet-based service delivery over Fiber-To-The-Home (FTTH) deployments.

Finally, the Allied Telesis family of intelligent Multiservice and Business Gateways provides inherent support for large-scale deployments using the state-of-the-art Zero Touch Configurator (ZTC) system fully featured further in this guide. Support for TR069 is scheduled for 2007.

For detailed information regarding these products please refer to the Allied Telesis 'Guide to iMG'.

IP Set-Top Box

Another critical component of the IP Triple Play network is the video CPE or Set-Top Box (STB). Each TV set will typically have an IP-based STB associated with it. In concept, these devices are similar to those used by traditional cable TV Operators or satellite TV Providers, except that the network interface is a standard 10/100 Ethernet port rather than the legacy, coaxial cable connection. Allied Telesis has partnered with specialist IP STB vendors such as Kreatel and Amino to ensure the integrity and availability of end-to-end IP Triple Play service. See pg 18 for more information on Technology partners.





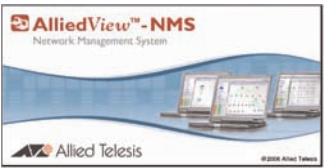
Systems Management

Middleware

A crucial component of the video element of IP Triple Play is the 'back office' operational support system, at the central layer of the network commonly known as 'Middleware'. The Middleware controls billing, premium channel access and other operations of the video service and Set-Top Box (STB). It is therefore critical to ensure and verify performance and interoperability between the Middleware and the STB at the subscriber premises. Allied Telesis has partnered with Middleware vendors such as Tandberg Television and Minerva Networks to provide the required interoperability testing and verification. See pg 18 for more information on Technology partners.



Network Management System (NMS)



Just as critical as any other component in an IP Triple Play delivery solution is the overall management of the various network elements. It

is crucial for a network service provider to be able to have a comprehensive network management suite to ensure service quality is maintained and problems are eliminated. A network management system must offer performance monitoring and stringent event/alarm notification capabilities to enable this kind of proactive service management. For this purpose, Allied Telesis offers the AlliedView™-NMS Network Management Software that will manage all of the Allied Telesis elements in the IP Triple Play solution. With extensive management capabilities, the AlliedView™-NMS allows the operator to manage hundreds of Allied Telesis network elements from a remote operations center – so reducing the need for a 'truck roll' and 'man-in-a-van' operations in order to perform diagnostics or provision changes. Via an intuitive interface, the AlliedView™-NMS substantially decreases the time required for deploying and provisioning large networks. Rapid deployment of services is made available via features such as flow-through-provisioning. Software upgrading to add new features is also a simple, in-service process.

Among the key strengths of the AlliedView™-NMS are network monitoring and service provisioning. The AlliedView™-NMS streamlines the provisioning and equipment configuration process by allowing auto-discovery and detection of physical devices. Other powerful network monitoring capabilities include:

- Automatic topology discovery
- Complete network view of various Allied Telesis products
- SNMP-compliant for interoperability with third-party products
- Automatic synchronization of network devices
- Network back-up and restore for all Allied Telesis product configurations
- TFTP server access for storing customer configurations

Zero Touch Configuration (ZTC)

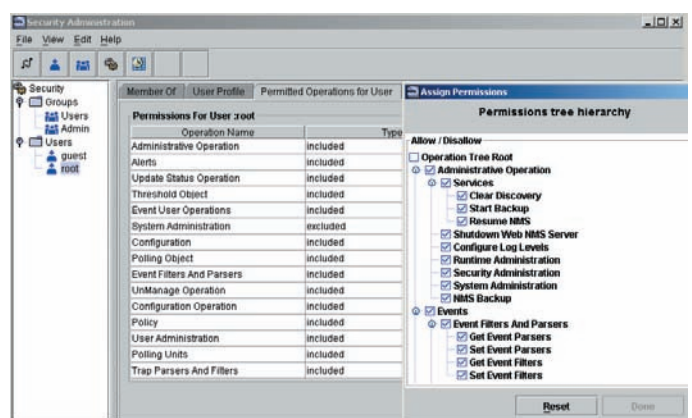
One way in which a IP Triple Play solution can fail is when it is simply too complex to provision and manage. All network devices need to be accurately configured, provisioned, fine-tuned and maintained in order to function as a complete solution. The resulting workload can be very high especially considering that these components are often difficult to access in the first place. Both of these problem areas lead to expensive operating costs (OPEX), as well as potentially complex technical problems that can bring the service down for hours at a time.

Allied Telesis has introduced Zero Touch Configurator (ZTC) - a framework that enables these network components to be remotely configured from a central location. The ZTC system consists of three main elements – a web interface, a TFTP server with embedded client, and the ZTC server with underlying database architecture. This latter element is at the heart of the system and manages the configuration data for the network devices. Its main purposes are to provide layered security and multiple user profiles and device configuration consolidation. Multiprotocol support (TFTP, HTTP, HTTPS, etc), high availability and fault tolerance mechanisms are all built-in. The ZTC is based on J2EE™ and XML technology, making it a flexible application that adapts itself to the Operators' network needs and existing OSS systems. It's a scalable and secure platform and is based on an industry-standard LDAP server architecture where each end device communicates securely with the ZTC Server using a local application called ZTC embedded Client.

Overall, ZTC manages the delivery network in a way that is both simple and secure – the best of both worlds.



Zero Touch Configurator (ZTC)



AlliedView™-NMS

Business Case for IP Triple Play in Europe

The most common service required by end-users in recent years – basic Internet access, has not proved a viable form of revenue and profit for Operators and Service Providers. As a loss leader, or a Trojan horse, designed to pull customers in and then sell them higher-value services, Internet access is a great attraction and extremely successful. The problem is that to date, few Service Providers have been able to provide those higher value services that customers want, such as a lower cost alternative to satellite and cable TV broadcasters, video rental, or even combined Internet/voice services. By capitalizing on technologies such as IP video and xDSL, along with protocols like IGMP and QoS techniques, Service Providers can offer cable TV type services, high-speed Internet access, traditional telephony and other value added services over their existing fiber and copper infrastructure.

The obvious attraction of adding IP-based services such as Video-on-Demand is that they can realize several times the revenue of a basic Internet access service. When you consider what cable and satellite TV Service Providers charge currently, it is not unrealistic to say that Service Providers offering IP Triple Play can potentially multiply their revenues several times over once a combination of economies of scale, to them, and breadth of services to the end-user become available. If we take an example from a typical household in Europe, the breakdown for costs is approximately as follows:

Service Being Provided	Monthly Costs (Euro)
Internet Access Account (broadband)	10
Satellite TV (multi-channel package, exc. PPV)	50
Telephone (inc. local calls only)	40
Minimum Monthly Costs (Euro)	100

So we have a minimum – excluding any Pay PerView television, Internet-based music services or long-distance/international phone calls – monthly cost of 100 Euros. A basic, all-in-one, DSL-based solution would cost around 10 Euros a month at current service provider charge levels in Europe. This would not include broadcast TV, but we can see the potential for Service Providers here to offer 'Triple Play' for anything less than 100 Euros per month and reduce the cost for the subscriber on current rates. The potential, therefore, to significantly undercut existing suppliers, yet increase revenue perhaps several fold, is huge.

Of course, the best service plans in the world will falter if the costs of introducing and maintaining those services are too high. Here is where an Ethernet-based solution such as that offered by Allied Telesis makes sound financial and business sense. Ethernet has always been a far cheaper and simpler technology to deliver than ATM, and legacy SDH, typically 5-10 times less expensive to deploy and manage in the long term than the classic technology alternative, according to studies in the US by the Dell'Oro Group and the Yankee Group.

Combine this with the influx of IP-based services such as streaming video and the argument in favour of Ethernet is immediately strong. Few would therefore disagree that building an Ethernet-based, IP network is the logical way forward for Service Providers if they are to minimize deployment costs and maximize service provision.

Technology Partner Program



Technology Partners

The building blocks of the Allied Telesis IP Triple Play solution are made up of several elements that interwork to provide voice, video and data applications and related services. While Allied Telesis provides the networking elements of the solution, partnership agreements have been established with other components vendors so we can offer our customers a 'best-of-breed', end-to-end solution. Allied Telesis tests, verifies and 'certifies' all system's elements to provide a reliable end-to-end solution for the service provider.

The Allied Telesis Technology Partner Program offers Carriers an end-to-end network solution that has been tested and certified by Allied Telesis and its partners. Partnerships have been initiated with leading vendors of different elements of the IP Triple Play solution including Tandberg Television, Minerva Networks, Amino, KreateL, Thomson and others. Allied Telesis System Integrators will provide complete project management for IP Triple Play network deployments acting as the central point of engagement for the Carrier.

A key requirement of all Allied Telesis 'partners' is the ability to provide sufficient support of network deployments of Triple Play. This support includes rapid problem escalation and resolution of field issues. Allied Telesis will use its advanced testing facilities, the Customer Solutions Centers, located in Raleigh, North Carolina (USA) and Milan, Italy (Europe) to configure replica customer networks and to test, verify and 'certify' the interworking of the customer's preferred network elements. This certification will prove invaluable when testing new software releases, field upgrades, etc. prior to actual live network deployment.

The Allied Telesis partnership program is then a key advantage for Carriers seeking to outsource the network engineering and verification functions to a primary vendor and its certified channel partners. It enables fast service deployment and saves costs in all areas, both during the initial stages and throughout the service lifespan.



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Summary

As today's Service Providers attempt to maximize revenues and profitability, offering an IP Triple Play package of voice, video and data is increasingly shifting from being a leading option to becoming a survival requirement. Reducing customer churn and increasing revenues per subscriber are just two results the Carrier can expect to achieve from offering Triple Play, as well as the opportunity to improve customer service at the same time.

To enable Service Providers to take advantage of this opportunity, Allied Telesis has created a complete end-to-end solution for providing IP Triple Play services over an IP/Ethernet network. Allied Telesis has gone beyond simple network engineering by testing and verifying the network integrity in conjunction with our Technology Partner Program.

In choosing to deliver Triple Play, the forward-thinking service provider needs to focus on an end-to-end solution that will ensure revenue continuity and ease of maintenance. With bundled services, the much higher revenue per subscriber places a high demand on service uptime.

The iMAP 9000 series deliver a video-optimized, Carrier-class Ethernet platform designed to provide the highest availability uptime in the access and aggregation network. The AT-86xx and x900 high performance Layer 2/Layer 3 Gigabit Ethernet products, along with the iMG 600 and iBG 900 series multiservice residential and business gateway solutions, complete the architecture by ensuring that end-to-end, high quality IP Triple Play services can always be delivered.

To simplify installation, provisioning, and maintenance, as well as multi-device software upgrades, configuration, backup, and restore, the AlliedView™-NMS combined with the Zero Touch Configurator platforms provide an end-to-end management system tailored for tomorrow's Operators. The NMS manages service provisioning such as end-to-end VLAN provisioning and QoS policy management.

In addition, Allied Telesis certified solutions can be designed, engineered, installed and maintained by trained Allied Telesis partners, to ensure service availability and a faster route to revenue generation.

Allied Telesis offers the experience, knowledge and technology to provide unparalleled performance capabilities for delivering revenue-enhancing services such as Triple Play. The ability to seamlessly integrate new and existing network configurations and deliver industry-leading DSL or FTTx performance, both in bandwidth and distance terms, will optimize the Total Cost of Ownership (TCO) and Return On Investment (ROI) on an Allied Telesis solution.

Finally, the iMAP 9000 series combined with the iMG 600 and iBG 900 family of multiservice gateways offer a path to future value-add services that create new revenue streams for Providers and Operators of all sizes. It means more bandwidth, more distance, more services, more revenue and less cost. A winning solution for everyone in the value chain.

Working Together

Working with Allied Telesis and its technology partners, Operators can optimize their business models to reduce capital and operational expenditure, reach profitability quicker and retain loyal and existing customers.

Allied Telesis has the expertise and knowledge to enhance your business offering and grow your profits with Triple Play.

Make Allied Telesis your IP Triple Play choice!

For further information on Allied Telesis' IP Triple Play Solution, please refer to the 'IP Triple Play Brochure', 'Guide to iMAP', 'Guide to iMG' and the 'Executive's Guide to Carrier Ethernet'.

www.alliedtelesis.com/nsp



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